

INVENTOR

Chen Wei
74 Pipashan Zhengjie
Chongqing City, Sichuan Province
CHINA 400013

The inventor is a citizen of the Peoples Republic of China.

TITLE OF THE INVENTION

AUTOMATICALLY ADJUSTING SELF-TIGHTENING WRENCH

Submitted by:

Donn K. Harms
Reg. No. 38,911
Patent & Trademark Law Center
12702 Via Cortina, Suite 100
Del Mar, California 92014
Tel: (858) 509-1400

AUTOMATICALLY ADJUSTING SELF-TIGHTENING WRENCH**FIELD OF THE INVENTION**

The disclosed device relates to a self adjusting self
tightening wrench. More particularly it relates to a wrench with
10 a handle and rotationally pivoting jaw member which form a
substantially parallel grip on objects throughout the range of
rotation of the jaw member which will accommodate an infinite
number of sizes of objects to be rotated by the wrench between
the wrench's minimum and maximum mouth openings.

BACKGROUND OF THE INVENTION

Adjustable wrenches in the past have generally been of a
type which laterally translates a moveable jaw member away from
and toward and fixed working surface on the wrench handle. By
20 translating the jaw member further away, using a geared
mechanism, the distance between the fixed working surface on the
handle and the moveable working surface of the jaw member may be
increased to a finite distance. This allows such adjustable
wrenches to accommodate a range of sizes of bolts, pipes, nuts,
25 or other objects needing rotational movement. Similar
adjustable pliers allow for the increase of the dimension between
the working surface of the fixed handle and the pivoting jaw
member by slidable engagement of cooperatively engageable tracks
on both the handle and the jaw member. This again allows for

5 adjustment of the distance between the working surface of the jaw member and the handle to be adjusted to accommodate the object being gripped for rotation.

Such conventional adjustable wrenches do however provide for a continuous and automatic adjustment of the force or tightness of the "grip" which the wrench had on a work piece. 10 Consequently, because the adjustable wrench was not sized to the object being worked on, slippage occurred of the wrench on the object being turned resulting in a "knuckle buster" which has been a constant source of aggravation to the user of such wrenches. Further, such adjustable wrenches generally require some movement of an adjusting mechanism by the user which requires two hands and a reasonable high amount of dexterity.

As such, there is a pressing need for an easily functioning adjustable wrench. Such a wrench should automatically adjust to the object placed between its jaws. Such a wrench should not slip when twisted and should ideally increase the force of the grip on the object being rotated between the jaws when the force on the wrench is increased. Further, such a wrench should maintain relatively equal pressure on both sides of the object 20 being twisted to maximize grip and minimize distortion of the object of the wrench's force. 25

SUMMARY OF THE INVENTION

The above problems, and others are overcome by the herein disclosed automatically adjusting self tightening wrench.

10 The device is composed of a handle and rotating jaw member having a gripping surface area on a distal face of the jaw member. The jaw member is rotationally attached to the handle at the opposite end from the area to be gripped by the user. The rotation of the jaw member is generally about a pin or axle used to secure it to the distal end of the handle. In the current best mode, the jaw member rotates about the pin and into a slot grooved into the handle just below the pin thereby allowing the jaw member to rotate on the pin with the attachment end of the jaw member rotating into the slot.

20 The gripping surface area of the jaw member at an angle substantially normal to the center axis of the elongated handle when the jaw member is in a fully biased position rotated to its closest point to the work surface formed on the end of the handle. The handle gripping surface is formed on a working face portion shaped like an arc. When the jaw member rotates about the axle, the jaw gripping surface area of the jaw member becomes
25 increasingly distant from the handle gripping surface formed on the arced face of the handle because both circles have different center points. This increase in distance allows the device to accommodate larger and larger objects between the jaw gripping

5 surface and the handle gripping surface as the jaw member is
rotated to increase the distance of the planar face of the jaw
member and the jaw gripping surface thereon, away from the handle
gripping surface on the handle face.

10 A biasing means such as the spring shown in the current best
mode of the device, is in communication at one end with the
static handle and at the other with the rotating jaw member and
biases the jaw gripping surface area on the planar face of the
jaw member toward the handle gripping surface formed on the
15 arcing face of the handle, at all times. This allows the device
to immediately self adjust to the diameter of the object placed
between the gripping surface on the face of the jaw member and
the jaw gripping surface on formed on the face of the handle
opposite the end to be held by the user.

20 Unique to the disclosed device is the maintaining of
generally parallel contact between gripping surfaces no matter
what the size of the object inserted therebetween. This is
accomplished by the arc shape forming the working face on the
handle on which the handle gripping surface resides. By forming
the working surface in an arc, and forming the jaw gripping
25 surface on a generally planar face that is normal to the center
axis of the handle at its closest position, when the jaw is
rotated about the axle pin on the handle, a generally parallel
contact of both gripping surfaces on the object therebetween is
maintained. As can be seen, the actual surface area of an object

5 touching the arced surface of the gripping end of the handle is very small thus providing the generally parallel contact between both gripping surfaces at all points in the rotation of the jaw member.

10 In the current best mode, teeth or a gnarled surface would be provided on both the arced face of the handle and the planar face of the jaw member. This allows for a better frictional connection between the object being rotated between the jaw member and the handle during use. The formed teeth or other frictionally engaging surface are best angled to allow maximum grip when the wrench is torqued in the direction of object rotation which occurs when the gripping end of the handle is forced toward mouth opening formed between the jaw member and the arced handle face. The arrangement of angling the teeth would also allow the device to slip when the wrench is pulled in the opposite direction of intended rotation which occurs when the hand grip end of the handle is pulled away from the mouth opening. This allows the device to slip in one direction and grip progressively harder in proportion to the force applied in the other direction.

25 Finally provided to make the device even more user friendly is the thumb grip on the exterior surface of the jaw member. This area of the jaw member is notched or otherwise surfaced for easy frictional engagement of the user's thumb or finger with the jaw member. This allows the user, with only one hand, the place

5 the mouth opening of the device over the object for rotation and
then to pull open the jaw member still using one hand by simply
pressing with the thumb or finger on the thumb grip to overcome
the force of the biasing means and remove or readjust the device
from the object being turned.

10 Accordingly, it is the object of this invention claimed
herein to provide a simplified and easy to use self adjusting
wrench which will tighten its grip on the object being turned as
the force applied to the handle is increased.

15 It is another object of this invention to supply such a self
adjusting wrench that will relax its grip on the object being
turned and slip when pulled in the opposite direction of intended
object rotation.

20 It is still another object of this invention to provide such
a self adjusting wrench which has a biased jaw allowing the user
to use the device with only one hand and secure it over the
object to be turned.

25 It is a still further object of this invention to provide an
easy thumb release on the jaw of the device such that the user
can release it from engagement with the object to be turned still
using one hand and the thumb to overcome the biasing means.

It is yet another object of this invention to provide a self
adjusting wrench which by using a curved gripping surface on the
handle and planar surface on the jaw maintains a substantially
parallel engagement upon the object being turned by the wrench

5 and substantially equal imparting of force by each working face
upon the object turned.

Further objectives of this invention will be brought out in
the following part of the specification, wherein detailed
description is for the purpose of fully disclosing the invention
10 without placing limitations thereon.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

The accompanying drawings which are incorporated in and form
a part of this specification illustrate embodiments of the
disclosed processing system and together with the description,
serve to explain the principles of the invention.

Figure 1 depicts a side view of the disclosed self adjusting
wrench showing it with the jaw gripping surface in the closest
position to the handle gripping surface.

Figure 2 depicts a side view of the disclosed self adjusting
wrench showing the jaw gripping surface of the jaw member in the
position furthest from the jaw gripping surface of the handle.

Figure 3 shows a side view of the device with the handle cut
away to reveal the interior cavity for travel of the jaw member
25 on the axle pin and the biasing means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 - 3 preferred embodiments of the disclosed device 10 with figure 1 depicting a side view of the disclosed self adjusting wrench device 10. The device 10 features a handle 12 having a grasping end 14 and a working end opposite the grasping end 14.

A rotatably mounted jaw member 18 is mounted to the handle 12 at its working end 16 using a pin 20 or axle which communicates into the handle 12 and jaw member 18 and attaches the jaw member 18 in rotational engagement with the handle 12 about the working end 16 of the handle 12.

On the working end 16 of the handle 12 an arc shaped handle working face 22 is formed and on this handle working face 22 a handle gripping surface 24 is formed. The current best mode of the device 10 features the handle working surface 22 in an arc and forming the jaw gripping surface 26 on a generally planar face 28 of the jaw member 18 opposite the handle working face 22. By forming the jaw gripping surface 26 on a substantially planar jaw planar face 28 and rotating that gripping surface 26 around the arced handle gripping surface 24 the object 30 which is to be rotated is gripped at two substantially parallel contact points no matter what rotational position the jaw member 18 and jaw member gripping surface 26 is located in relation to the handle gripping surface 24 on the arced handle working face 22. This

5 curve or arc of the handle working face 22 and the handle
gripping surface 24 thereon, combined with the rotation of the
jaw gripping surface 26 around it during rotation of the jaw
member 18 thus provides substantially parallel contact points on
both sides of a gripped object 30 no matter what point the jaw
10 member 18 has rotated to accommodate the size of the object 30.
This of course substantially equalizes the pressure imparted to
both sides on which the object is gripped by the device 10.

15 The rotation of the jaw member 18 is as noted provided by
the axle formed by the pin 20 used to secure the jaw member 18 to
and in rotational engagement at the working end 16 of the handle
12. In the current best mode, the jaw member 18 rotates about
the pin and into a slot 32 grooved into the handle 12 just below
the pin 20 providing a relief into which one end of the jaw
member 18 may rotate into on the handle 12.

20 Automatic adjustment of the device 10 to the size of the
object 30 is provided by the rotation of the jaw member 18 about
the pin 20. As the jaw member 18 rotates, the jaw gripping
surface 26 on the jaw planar face 28 follows a circular path
around the pin 20 but becomes increasingly distant from the
25 handle gripping surface 24 formed on the arced handle working
face 22. This resulting increase in distance allows the device
to accommodate larger and larger objects 30 between mouth 34
formed between the jaw gripping surface 26 and the handle
gripping surface 24. The maximum size of the mouth 34 so formed

5 would be determined by the maximum distance of the jaw gripping
surface 26 from the handle gripping surface 24 and also by
changing the angle of the elbow 36 where it intersects the first
jaw member strut ³⁸36 and angles back on the second jaw member
strut ⁴⁰~~38~~ to determine the position of the jaw planar face 28 in
10 relation to the handle working face 22. Increasing the angle of
the elbow 36 would increase the smallest size of the mouth 34 and
the resulting largest size of the mouth depicted in figure ²~~3~~.
Also seen in figure ²~~3~~ are the two substantially circular paths 51
and 52 followed by the handle working face 24 and the jaw planar
face 28 respectively. These offset circular paths followed by
both surfaces thus increase and decrease the distances between
the two allowing for the size of the mouth 34 to increase and
decrease for the size of the object 30.

20 A means to bias the jaw gripping surface 26 toward the
handle gripping surface 24 is provided in the current best mode
by the spring shown in the current best mode of the device 10.
The spring 42 also in the current best mode has an elbow shape
and is sized to reside inside the slot 32 during use. As
depicted the spring 42 is attached inside the slot 32 at a first
25 end using a set screw 44 and to the jaw member 18 at the opposite
end in frictional engagement with an aperture 46. This type of
spring bends at the spring elbow 46 and therein biases the jaw
member 18 and affixed jaw gripping surface 26 area on the jaw
planar face 28 under biased force toward the handle gripping

5 surface 24 formed around the arced handle working face 22. This
bias allows the device to immediately self adjust to the diameter
of the object 30 placed in the mouth 34 by biasing the jaw member
18 back toward the handle gripping surface 24 at all times. It
also provides the ability to used the device with only one hand
10 by simply engaging the object to be turned into the mouth and
rotating the handle 12 toward the mouth side of the device 10.

In the current best mode, teeth 48 or an otherwise gnarled
surface would be provided on both the arced handle gripping
surface 24 and the jaw planar face 28 of the jaw member 18.
These teeth 48 allow for a better frictional connection between
the object 30 being rotated and the gripping surfaces on the jaw
member 18 and the handle 12 during use. The formed teeth 48 are
best angled to allow maximum grip when the wrench is torqued in
the direction of object rotation which occurs when the gripping
end 14 of the handle 12 is forced toward mouth side of the handle
20 formed between the jaw member and the arced handle face. The
arrangement of angling the teeth 48 would also allow the device
10 to slip when the wrench is pulled in the opposite direction of
intended rotation which occurs when the griping end 14 of the
25 handle 12 is pulled away from the mouth opening. This allows the
device to slip in one direction and grip progressively harder in
proportion to the force applied in the other direction. The
curved surface of the hand gripping surface 24 tends also to turn

5 into the object being held grabbing it tighter as more force is applied.

10 Finally, in the current best mode of the device 10 a biasing release is provided to make the device even more user friendly and useable by one hand. This is provided by the thumb grip 50 on the exterior surface 52 of the jaw member 18 and could be surfaced with teeth 48 or other frictional engagement style surfacing. The thumb grip 50 allows the user, with only one hand, to place the mouth 34 opening of the device over the object 30 for rotation and then to pull open the jaw member 18 still using one hand by simply pressing with the thumb or finger on the thumb grip 50 to overcome the force of the biasing means and remove or readjust the device 10 from the object being turned.

20 While all of the fundamental characteristics and features of the automatically adjusting self tightening wrench have been shown and described, it should be understood that various substitutions, modifications, and variations may be made by those skilled in the art, without departing from the spirit or scope of the invention. Consequently, all such modifications and variations are included within the scope of the invention as defined by the following claims.

25 What is claimed is: